University of British Columbia
Social Ecological Economic Development Studies (SEEDS) Sustainability Program
Student Research Report

Climate-Friendly Food (CFF) Labels Data Assessment Menu Item for the three dining halls (Open Kitchen, Feast and Gather)

2022 - 2023

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Executive Summary

As a response to rising concerns about climate change, the University of British Columbia (UBC) proposed the Climate Action Plan (CAP) 2030 to dramatically reduce greenhouse gas (GHG) emissions in the next 15 years. 17.9 billion tonnes of carbon dioxide equivalents (CO2 eq.), which account for approximately 34% of global GHG emission, is generated through the human-driven food supply chain. To reduce GHG emissions associated with food production, the Climate-Friendly Food Services (CFFS) team aims to display sustainability labels on each menu item sold at a few residence dining halls. This is to inform students at UBC Vancouver of sustainable food options and encourage them to develop climate-friendly dietary habits.

This research is a continuation of Silvia Huang's pilot project in 2021. Calculation metrics, such as emission baseline values and label cut-off values, are directly adopted from the pilot project. One of the concerns that were yet to be properly addressed in the pilot project is the heavy reliance on human labour in data analysis workflow. Current research focuses on improving the automaticity of the workflow to accelerate the analysis process, as well as launching a web-browser-based application that can be accessed from anywhere hence greatly improving the accessibility of sustainability labels. Primary data is collected with the assistance of UBC Food Services, which is exported from the food nutrition management service, Optimum Control (OC). The data on carbon, nitrogen and water footprint factors came from external secondary data sources.

One critical change that is made by this year's research team is moving the programming environment to PyCharm. PyCharm is an ideal environment for script automation and debugging.

In total, 775 food items are analyzed from the three residence dining halls: Feast, Gather, and Open Kitchen. 346 items are classified as green, 233 items as yellow, and 196 items are classified as red. This sets the distribution percentage of the green items to approximately 44.6% of all items analyzed, which highly increases the possibility of reducing food production-associated GHG emissions by 50%.

Although all menu items are successfully analyzed, the analysis workflow still leaves a few limitations. In the next phase of the study, it is recommended by that a new CFFS Data Analyst student to continue working towards improving the accuracy of the final outcomes.

Contents

Executive Summary i

List of Figures iii

List of Abbreviations iv

1. Introduction 1

1.1 Research Topic 1

1.2 Research Relevance 1

1.3 Research Context 1

1.4 Research Purpose, Goals and Objectives 1

2. Methodology and Methods 1

2.1 Research Methodology 1

2.2 Primary Data Collection 2

3. Results 2

4. Discussion 3

5. Recommendations 3

5.1 Recommendations for Action and Implementation 3

6. Conclusion 3

References

List of Figures

Figure 1 : Modified Evaluation Framework Flowchart 7
Figure 2 : Application Hindsight 8
Figure 3 : Label Count Distribution 10

List of ABBREVIATIONS

- UBC: University of British Columbia
- CAP: Climate Action Plan
- OC: Optimum Control
- GHG: Greenhouse Gas
- UBCFS: UBC Food Services
- CFFS: Climate-Friendly Food Systems

1. Introduction

1.1 Research topic

With increasing global concerns about uncontrolled GHG emissions and their detrimental impact on the food supply chain, the University of British Columbia (UBC) announced an ambitious plan to reduce the net GHG emission to zero within the next 15 years[1]. Through the Climate Action Plan 2030 (CAP 2030), UBC pledged to significantly reduce GHG emissions for both the Vancouver and Okanagan campuses. Among the actions geared towards reducing GHG emissions, UBC promised to lower the food systems and production associated GHG emissions to 50%.

This research focuses on designing and implementing sustainability labels for all menu items in three residence dining halls at the UBC Vancouver campus. Ultimately, we aim to assist in reducing GHG emissions associated with food production while providing environment-friendly options for students to make wiser dietary choices.

1.2 Research relevance

In this research, we partnered with the UBC Food Services (UBCFS) and the Alma Mater Society (AMS) to assign sustainability labels at three residence dining halls across the Vancouver campus and the Flavour Lab located at the Nest building. By assigning sustainability labels for each food item, students are encouraged to broaden their perspective and give more careful consideration when making dietary choices. Furthermore, through their constant exposure to the CFFS poster displayed in the aforementioned residence dining halls, students will gain deeper insight into CAP 2030 and UBC's strategies for achieving the goal.

Student purchasing behaviours, or their dietary choices, will be further studied by the CFFS team to observe any changes in the purchase trend compared to pre-label periods.

1.3 Project context

Menu items from Gather, Feast, and Open Kitchen are analyzed in the scope of the current research project. This is a continuation of Silvia Huang's pilot project, which was implemented from September 2019 to February 2020, with improvements in workflow automation and the development of a third-party web-browser-based application. Calculation metrics, such as impact baseline for emission factors, are derived from the pilot project and is continued to be used for the current research.

1.4 Project purpose, goals and objectives

A primary goal of the current research is to adhere to UBC's commitment to the CAP 2030 by achieving 50% GHG emission reduction by 2030. To achieve this goal, we designed an automated workflow that assigns the sustainability labels for all food items at Gather, Feast, and Open Kitchen. Once the analysis is completed and the labels are in effect, we implicitly encourage the students to make sustainable dietary choices and observe any noticeable changes made in their purchasing behaviours.

As an extension of the pilot project, our other goal is to increase the automaticity of the existing workflow. We also aim to enhance the accessibility to the sustainability label information to all students, hence not limited to the three residence dining halls, which can be addressed by developing a web-browser application.

2. Methodology and methods

2.1 Research methodology

This project follows an existing workflow developed by Silvia Huang and her colleagues, developed and published in 2020[2]. The workflow is designed in collaboration with researchers from the University of Michigan, Université Laval, and the University of Victoria who are working on similar climate food labelling projects (Huang, 2020).

Calculation metrics, including emission baseline values and label cut-off values, used in current research are adopted from Silvia Huang's pilot project.

To further automate the existing semi-automatic workflow, entire codes and data files are moved to the PyCharm developer environment from Jupyter Notebook. Instead of operating on several Jupyter Notebook files, the PyCharm environment requires only the main script to run to fully analyze the data.

2.2 Primary data collection research methods

2.2.1 Data Collection

All menu item data are derived from Optimum Control, which UBCFS personnels use to access and manage all nutritional information. Each menu item is broken down into its ingredients; workflow is first performed on individual ingredients, and a full menu item is later analyzed by encompassing impact values from corresponding ingredients. All data collection was completed by November 2022.

2.2.2 Evaluation Workflow

The evaluation workflow is divided into several individual steps, which are heavily dependent on the previous step. Thus all evaluations must be done respectively, in the order of how the steps are named.

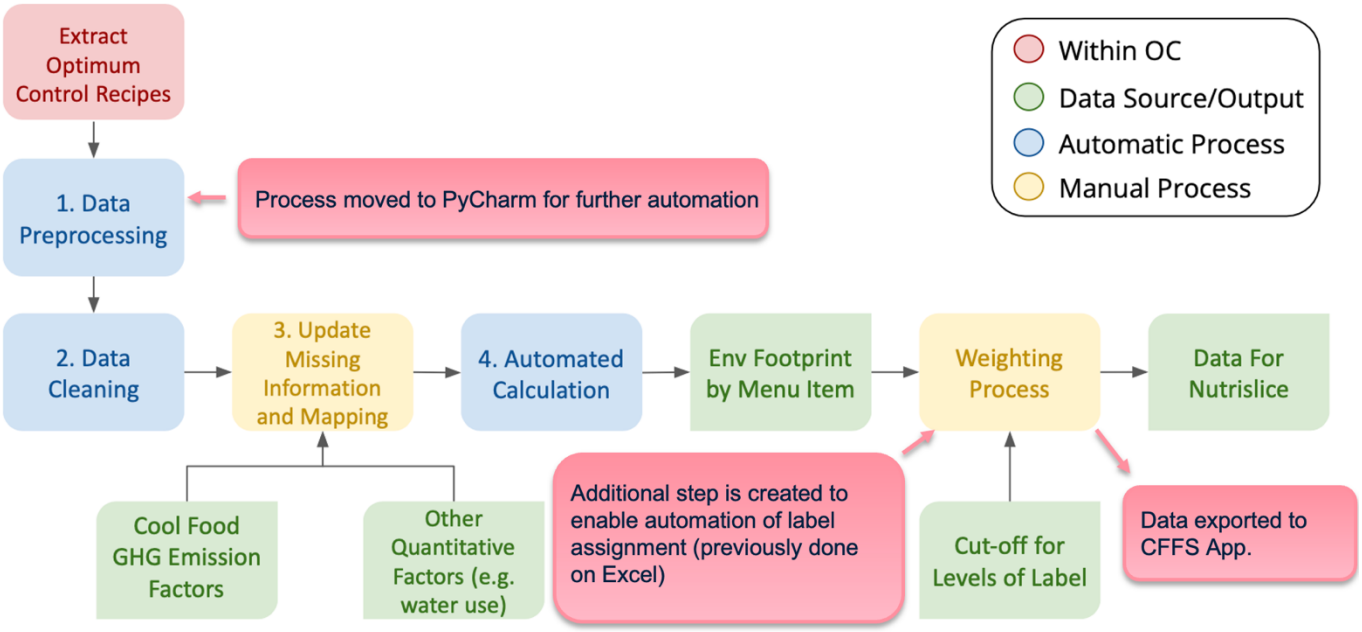


Figure 1 : Modified Evaluation Framework Flowchart

The workflow proceeds in the order of data collection, data pre-processing, data cleaning, updating conversion information and mapping, automatic calculation, and finally, assigning the sustainability labels.

The first step is to extract raw ingredients and recipe data from Optimum Control. Primary data are collected in XML format. As a following step, collected data are *pre*-processed; XML files are changed into CSV, and all items, ingredients, conversion factors, preps, and product information are collected into individual data frames. We relied on the Cool Food Calculator to gather the GHG emission factors, which include GHG emission footprints, nitrogen footprints, and water withdrawal footprints. We categorize each ingredient into one of the pre-defined categories set by the Cool Food Calculator, and match the emission factor information to the ingredient. Once all ingredients have gone through impact factor analysis, sustainability label for 100g of each menu item is assigned.

For more information on how the workflow is designed, refer to this slideshow and GitHub webpage.

2.2.3 Web-Browser-Based Application Development

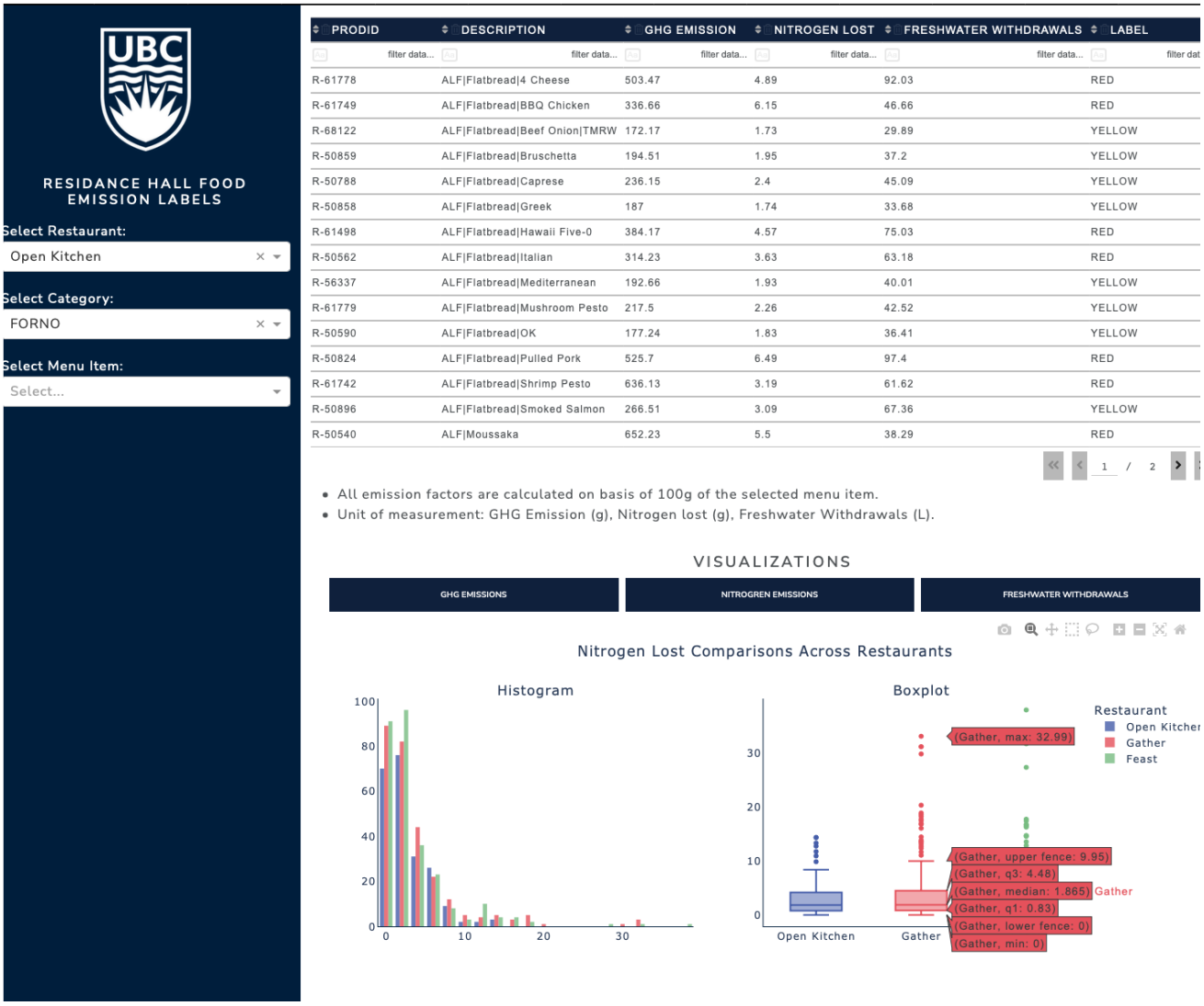


Figure 2: Application Hindsight

Accessibility to the sustainability label information is largely enhanced through development of a web-browser-based application. This application is fully developed in Python and launched with Heroku application platform. In this application, users are able to:

- Search by restaurant and category;
- Search for single menu item;
- Perform advanced search with keywords and conditions (e.g., “GHG Emission” > 10.0 g);
- Visualize GHG emission, nitrogen, and water withdrawal footprint distributions by restaurant.

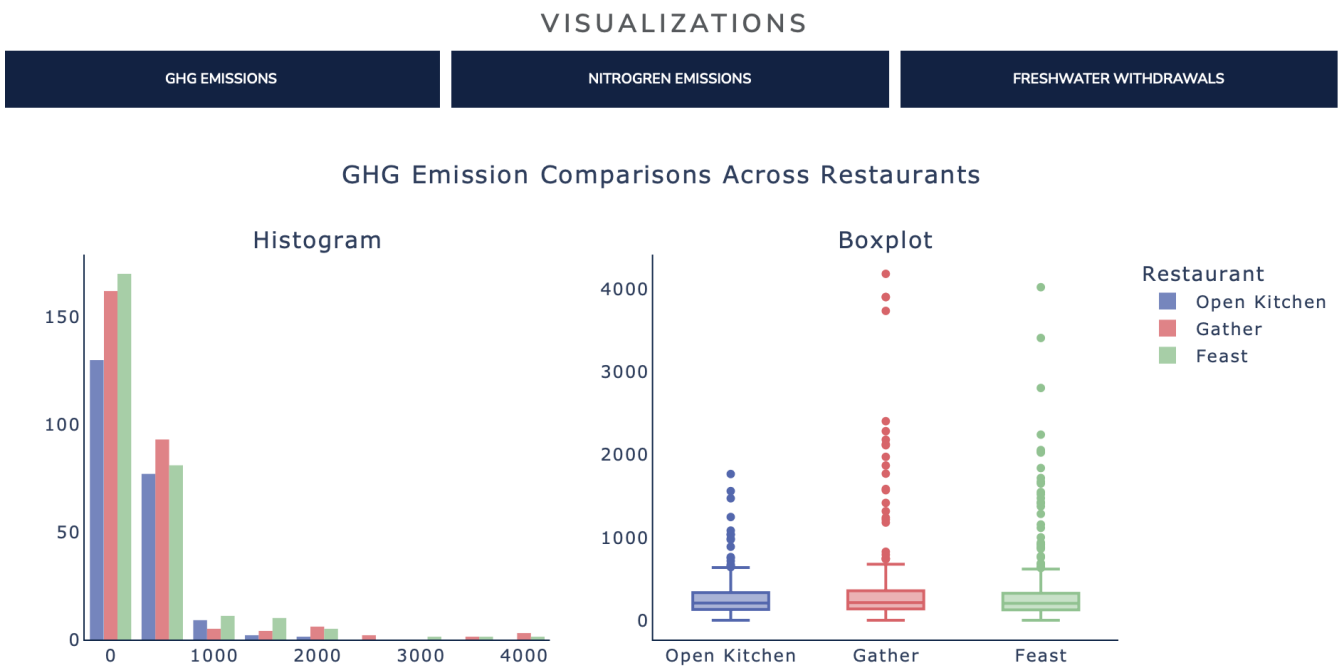


Figure 3: Visualizations within CFFS Application

The application will be active until March 2023, unless further management options are discussed. To access to application, follow this link. It will open on the user's primary browser. This application is first launched in January 2023.

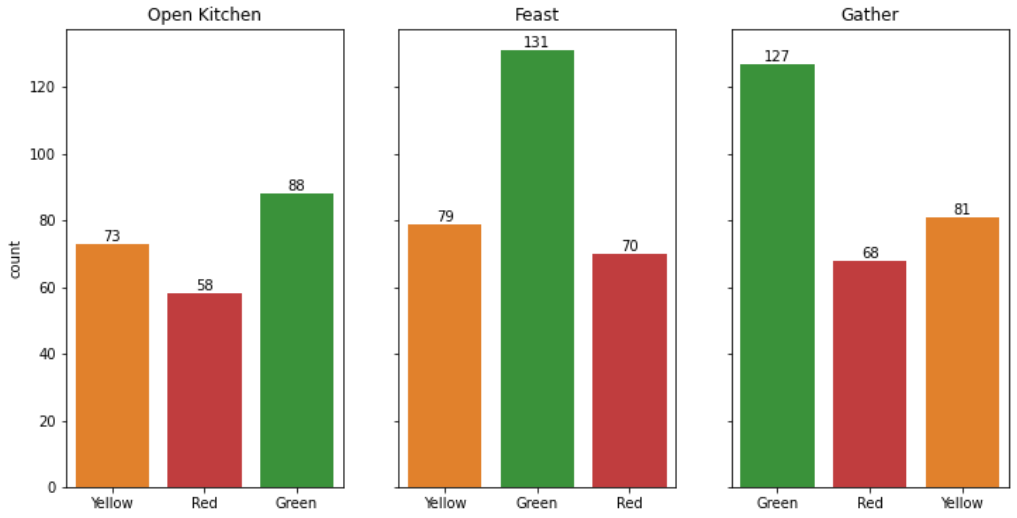
3. Results

In total, **775 menu items** are analyzed from the three dining halls.

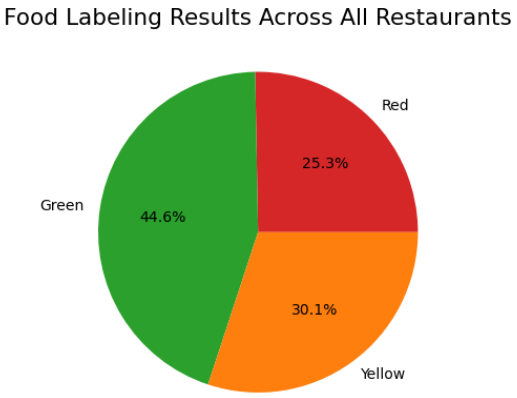
Label	Gather	Feast	Open Kitchen	Total
Red	68	70	58	196
Yellow	81	79	73	233
Green	127	131	88	346
Total	276	280	219	775

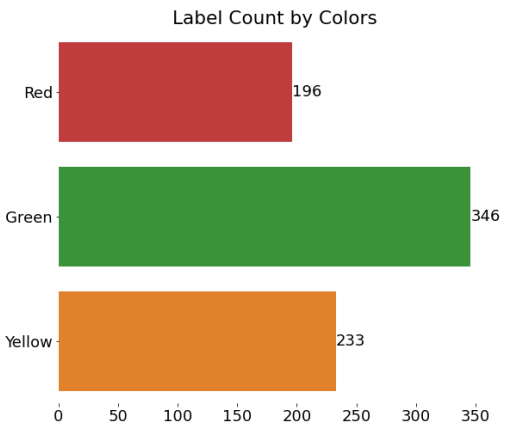
Table 1: Label Count Distribution

276 items from Gather, 280 items from Feast, and 219 items from Open Kitchen are analyzed. Among the three labels (red, yellow, green), items classified as *green* are most predominant.



a)





b) c)

Figure 3: Label Count Distribution

a) Distribution by residence halls, b) Distribution in pie chart, c) Distribution count by labels

Feast contains the largest number of *green-labelled* menu items across the three dining halls, while Open Kitchen has the smallest number of *green-labelled* menu items. Label distribution at Gather and Feast are similar to that of each other; Label distribution at Open Kitchen is more even between all three labels.

4. Discussion

From the above analysis, we found that approximately 44.6% of food items found in popular dining halls at UBC are labelled *green*. Label counts distribution at Open Kitchen is compared to that of 2021, and we observe similar trends for both years, with a slight increase in the number of items that are labelled *green*.

Percentage	2022 Fall	2021 Fall
Red	26.5%	29.5%
Yellow	33.3%	35.2%
Green	40.2%	35.2%

Table 2: Label Count Distribution at Open Kitchen

However, we must consider that the service at residence dining halls has changed over the years. An increase in the number of green items can be attributed to the change in the serving method. The high number of vegetarian options at Feast and Gather can explain the high number of green items found at the two residence dining halls.

The current workflow is explicitly tailored to what UBC has in place, such as data derived from Optimum Control. Although the majority of the process is automatic, assigning a Category ID for each menu item still requires a manual process. Inconsistent naming for the menu items limits the automaticity of the workflow.

Category ID, predetermined by the Cool Food Calculator, needs to be more specific in its scope. For example, thyme, which is classified as an herb, is incorporated into a larger category of “Other Vegetables.” Therefore, the current workflow may have minor flaws in correctly calculating the impact values and further in assigning sustainability labels.

5. Recommendations

As discussed in **Discussion**, current workflow can be improved by addressing the following concerns.

5.1 Recommendations for action and implementation

- Food category of the emission factors (external dataset from the Cool Food Calculator) is too general. It is advised to prepare a more specific method to calculate the impact values.
    - *E.g.*, “herbs” such as thyme are classified under Category ID 40, “Other Vegetables”.
- Automation of assigning Category ID to each ingredient.
    - Currently, category IDs are assigned based on the name of the ingredient– thus it is done *manually*. Instead, we can better automate the process by including some keywords that would link to a specific category ID.
        - E.g., if “Milk” is in the name of an ingredient, assign it to category 9.

5.2 Recommendations for future research

For a long-term process, it is recommended that **another student** would take over the Data Analyst position for the CFFS project. Since this workflow is not 100% automated, each time a new label needs to be created someone with *basic programming knowledge* needs to edit parts of the code.

Lastly, consultation with the Cool Food Calculator or other companies for their labeling assigning service may be considered.

6. Conclusion

The Climate-Friendly Food Services (CFFS) labelling project largely contributes to achieving UBC's pledge to reduce food production-related GHG emissions to 50% by 2030. Furthermore, sustainability labels assigned to each menu item at Feast, Gather, and Open Kitchen provide students with opportunities to reconsider their dietary habits and actively participate in climate protection. Current research successfully automated the existing data analysis workflow and developed a web-browser-based application. However, current research still leaves some limitations: the workflow still relies on a manual category-assigning step, increasing unwanted running time. Also, more specific external sources can be looked into to enhance analysis accuracy.

Once the other CFFS team observes any change in students' purchasing behaviours, it can hint at the direction UBC must take in future research.

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